ONYX
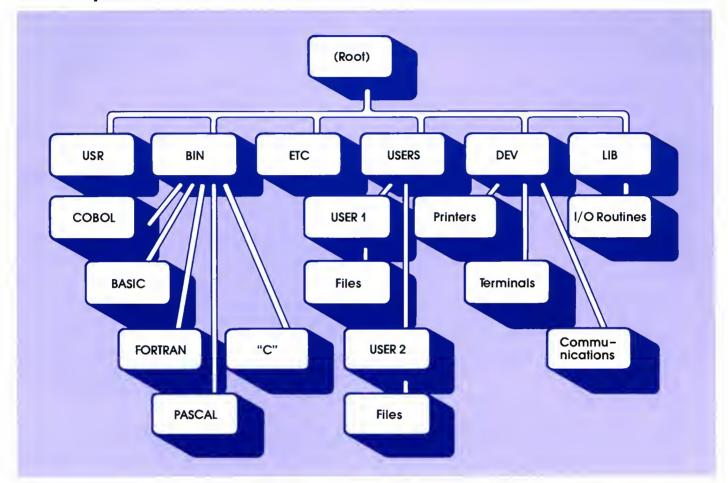## Onyx Systems, Inc.

Intelligent Multi-Programming, Multi-User Operating System

- Dynamic management of system resources based on system-measured changes in usage
- Sophisticated multi-programming facility for concurrent control of multiple processes
- Interprocess communications
- Dynamic memory management capabilities for code sharing
- Support for hardware-enforced separation of code and data

Secure Data System Management Facilities

- Multiple file access privileges — Read/write, Read only, Execute by individual user, group and global access
- Hierarchial file and directory structures

- Device-independent input/output
- Extensive communications facilities

Powerful System Management and User Utilities

- Log-on executive with password protection and automatic user configuration
- System usage accounting
- Output printer spooler
- Easy-to-use modules for both program development and production

Fully Supported Nationwide

- Maintenance
- Multi-level training program to meet user needs
- Consultation and assistance by telephone or on-site

System Description

The UNIX Operating System provides a powerful, multi-programming environment, normally associated with large computer systems, for the C5002, C8002 and SUNDANCE-16 series of computer systems.

UNIX Operating System uses the hardware protection features of the computer to maintain system and program integrity. Its memory management and multi-programming capabilities allow multiple user activities to occur concurrently, making optimum use of system resources.

For application development, UNIX Operating System supports BASIC, COBOL, FORTRAN and many other high level languages as well as programming aids such as a text editor and a debugger. UNIX Operating System provides an executive to control user log-on and ensure a convenient, secure multi-user environment in which all users are protected from each other. Its background processing capability allows multiple simultaneous background jobs to execute concurrently with interactive user jobs. Its spooling facility allows orderly usage of output devices by independent users.

Multi-Programming

UNIX Operating System is a multi-programming operating system which manages processes. A process consists of a user program with up to 128K bytes of address space together with its open files and the program's current state. UNIX Operating System controls a variable number of user processes independently and concurrently and protects each process from the activities of all other processes. A single user may initiate multiple processes with both foreground and background execution.

A process is assigned a base priority when it is initiated, but a user may specify a lower priority if the process is not urgent. More than one process can have the same priority. All processes existing at any one time are related in a "family-tree" structure.

Parent processes create children which in turn may create other processes.

In operation, UNIX Operating System allocates CPU time to processes dynamically based on their priority. Processes are eligible for CPU time if they have been allocated memory and are not waiting for some external event such as a console input/output or a message from another process. Among eligible processes, UNIX Operating System gives control to the highest priority process. To ensure that each user has equitable CPU time, UNIX Operating System grants less time to processes that fully utilize their time-slice by assigning them a lower priority. This allows interactive processes which need short bursts of CPU time to gain access to the CPU more often. As a result users entering data have fast response time.

Interprocess Communication

UNIX Operating System lets processes communicate with each other, using special files. Processes sending messages can continue activity if no receiver is waiting for the message. Conversely, UNIX Operating System can suspend a process that wishes to receive a message until another process sends the requested message.

Memory Management

UNIX Operating System provides dynamic memory management assisted by the hardware memory management capability. Every process is dynamically allocated up to 128K bytes—the process logical address space—for inclusion of program code and data.

The process memory is divided into three parts: a user text segment for program code which may be shared by all processes executing the program, a user data segment and a stack segment. The stack and data segments cannot be used by other processes. Each process can redefine the size of its user data area dynamically. When a process is suspended, its data areas are written to disk, but its code area may remain for use by other processes. These code areas may be shared concurrently by multiple users.

File Management

UNIX Operating System provides data management capabilities including complete file protection, device-independent I/O, and hierarchial file directories to catalog programs and data.

UNIX Operating System has three types of files — ordinary files that contain programs and data, peripheral device files, and directory files. Each directory file entry contains the name of a file and a pointer to a data block containing the user ID of the owner, and other information needed to locate the data in the file. Like processes, all file directories are related in a 'family-tree' structure. The initial parent is termed the root; it contains entries for all the other directories. Every process has a working directory and a list of other directories to consult if the process cannot find a file name entry in the working directory.

File Security

UNIX Operating System provides a secure protection scheme that prevents unauthorized or accidental use or alteration of data accessed through the directory structure. Access privileges include read, write, and execute access. These privileges differ slightly depending on whether an entry is in fact another directory or a data file. The owner of a data file or directory can change the access privileges during the life of the file. UNIX Operating System maintains flags for each file that identify the users that can access the file as well as the privileges each type of user is allowed. This access control mechanism provides sophisticated protection in the system while simultaneously simplifying procedures for the individual user. Onyx augments these standard UNIX Operating System features with a robust and consistant file and record-locking facility for absolute security when multiple users are accessing data in a single file.

Device-Independent Input/Output

UNIX Operating System provides a flexible system for accessing files on peripheral devices. To execute an I/O transfer to any device, users simply open the file, read or write file data, and close the file. Users can read/write blocks of data or do character by character I/O. Block data transfers are supported on disk units and magnetic tape cartridge. Blocks are 512 bytes long. The input and output format of data used by processes is common throughout the system. Output from one process can be transferred to I/O devices, files, or may be directed as input to another concurrent process under the direction of the program.

User Interface

The UNIX Operating System User Interface (the shell) lets users perform file and process maintenance at each interactive terminal. The shell is also used to execute programs, as well as executing functions built into the shell itself. The shell works either interactively with the user or non-interactively with a file containing shell commands. Some of the operations the shell can invoke include creation, maintenance and backup of files, directory creation and maintenance, and spooling control.

One of the shell's great advantages is the communication facility with which data output from one shell operation can be used as input to a succeeding shell command. These 'pipes' coupled with the powerful device-independent I/O capability allow users to create complex operations using existing functions, eliminating the need to write special programs.

The shell command file facility enables users to combine and execute a series of commands with a single name while passing variable parameters. The command language includes conditional command execution, compound commands, and error handling. The same communication facility between shell commands is also available when used in a command file. Shell command files can call themselves or other shell command files.

Utilities

A wide variety of system utilities provide program development and system management tools. Program development tools include:

- A Text Editor which lets users edit program source and data files as well as prepare documents for printing

- A linking Loader which links object files to produce an executable program file
- A Debugger which lets users examine memory, set breakpoints and test interactively

With its Spooler, UNIX Operating System ensures that multiple users can send output to printers directly or via asynchronous communications lines in an orderly manner.

Other system utilities include system usage accounting software which maintains user-level accounting information and an initialization process which validates each log-on user against the user's password before creating a process for him.

System Options

• User Programming Languages

UNIX Operating System user programming languages fulfill a variety of commercial, scientific computational applications. 'C,' the native language included with the UNIX Operating System, is a general purpose programming language well suited to implement numerical, text processing and database applications. Although 'C' matches the capabilities of many computers, it is independent of any particular machine architecture, so that with a little care it is easy to write 'portable' programs. FORTRAN is particularly well suited to engineering requirements. BASIC is suitable for educational and interactive business applications. ANSI '74 COBOL supports a multi-key ISAM needed for commercial processing.

BASIC is a business oriented language that makes it easy to process all kinds of data in the business environment. It supports decimal arithmetic computations and sophisticated alphanumeric data manipulation. Data and file descriptions can be defined once for use in all application programs, simplifying program maintenance and reducing programming errors. Powerful print capabilities make it easy to format reports, safeguard check figures and make use of preprinted forms.

The COBOL is an interactive version of the ANSI 1974 standard of this widely used business applications language. COBOL offers full file input/output capabilities, including sequential, random and indexed (keypad) file organizations. Support for formatted screen displays simplifies programming when implementing data entry applications. Interactive debugging also speeds the program development cycle.

The PASCAL language is a recently developed high-level language designed for implementation of structured programs, ease of use, completeness and convenience. Structured programming is a method used to simplify the identification and correction of logical errors in programs, thus achieving greater programmer efficiency. The PASCAL offered by Onyx under UNIX operating system is USCD PASCAL, a recent popular variation that provides more interactive capability than earlier PASCAL versions.

• Source Code Control System

The Source Code Control System is a collection of utilities which may be utilized to track and control collections of source code and/or documentation. Changes from base state are maintained in special files, and the capability exists to return a source file to a previous state by date or revision level.

System Support

System support encompasses a broad range of services available to every user of Onyx products. Product documentation is complete and concise. Training facilities with experienced instructors are available to introduce new customers to Onyx products. Seminars include both lecture and 'hands-on' sessions so that users gain experience with the system before using it on their own. Product specialists are available for consultation either by telephone or at the customer's place of business. They provide assistance if problems occur, as well as answering question from new users of Onyx products.

Important

The materials contained herein are summary in nature, subject to change, and intended for general information only. Details and specifications concerning the use and operation of ONYX equipment and software are available in the applicable technical manuals, available through local sales representatives.

ONYX

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